

Department of Chemistry

MISSION, OBJECTIVES AND OUTCOMES

Mission Statement

Department of Chemistry aims to provide the facilities to train the incoming students up to the extent that they can meet the requirement of country when they are supposed to work in teaching / Research institutions or in industries in Pakistan or abroad. Broadly produce skill manpower in the specified field of the country.

M. Sc Chemistry Program

(Program Mission, Objectives and Outcomes)

Standard 1-1: The program must have documented measurable objectives that support faculty / college and institution mission statements

Mission Statement for M. Sc Chemistry

Department of Chemistry aims to provide the facilities to train the incoming students up to the extent that they can meet the requirement of country when they are supposed to work in teaching / Research institutions or in industries in Pakistan or abroad. Broadly produce skill manpower in the specified field of the country.

Program objectives

The department has the objectives to provide the knowledge in chemistry on both theoretical and practical so that they can meet the future challenges and be able to:

1. Apply their knowledge to produce the required product or chemicals if they are supposed to do so.
2. Design and run the project independently.
3. Analyze and produce the solution to different problems.
4. Improve oral and written communication skills.
5. Work as a team member.
6. Enhance and utilize their hidden potentials in the field.
7. Grow in the field of Chemical Sciences.
8. Develop students in terms of catering knowledge and management skills.
9. Know about their history and religious culture.

Objective	How measured	When measured	Improvement identified	Improvement made
1,2,3,5,8	Student Course Evaluation Questionnaire	2010	Lack of course organization, Lack of learning resources, lack of practical material, Shortage of books.	
4,6,7,9	Survey of Graduating Students	2010	<ul style="list-style-type: none"> ➤ Program objectives achievements need more attention ➤ Infrastructure ➤ Lack of chemicals to perform practical work 	

Standards1-2: The program must have documented outcome for graduating students .It must be demonstrated that the outcome support the program objective and that graduating students are capable of performing these outcomes.

Program Outcomes

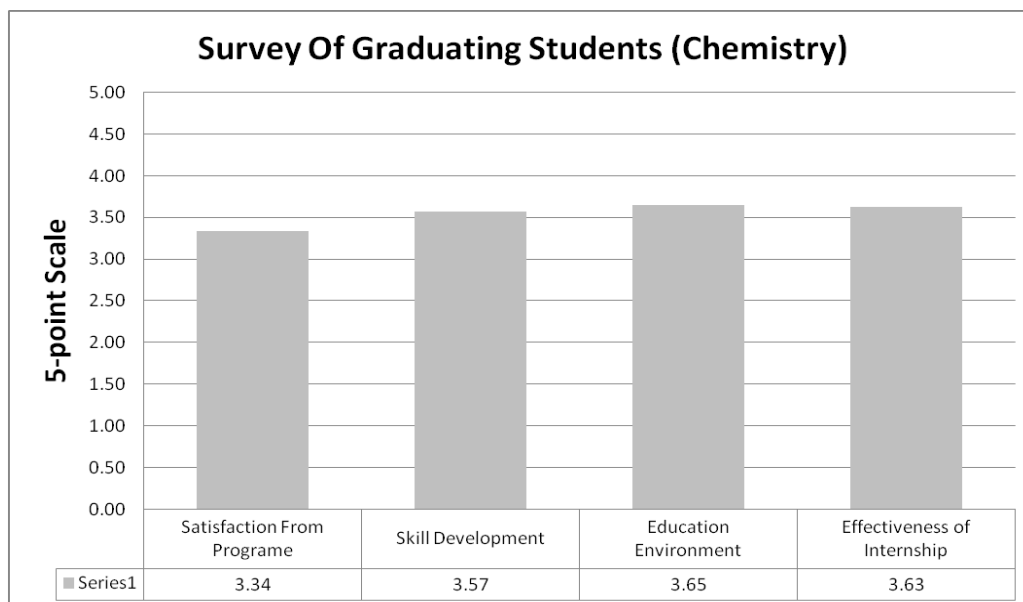
Program objectives will result in following outcomes:

1. Students are able to apply theoretical knowledge into practical.
2. Students are able to run the project individually.
3. Students are able to analyze and produce the solution to problems.
4. Students be able to communicate effectively in written and oral
5. Students are able to work as team member.
6. Students are able to utilize the hidden potentials.
7. Students are able to grow themselves in the market.
8. Students are able to apply management skills.
9. Students shall have sound knowledge about their history and religious culture.

Program Objectives	Program Outcomes								
	1	2	3	4	5	6	7	8	9
1	√								
2		√							
3			√						
4				√					
5					√				
6						√			
7							√		
8								√	
9									√

Standard 1-3: The results of programs assessment and the extent to which they are used to improve the program must be documented

After the assessment of Graduating students' survey, the strength and weaknesses identified.



- **Areas for improvement**
 - Program objective achievement need more attention
 - Infrastructure
 - Lack of chemicals for practical work
 - Oral & Written communication skills

Describe the actions taken based on the results of periodic assessments

Actions to be taken on the recommendations of AT visits

- **Strength and weakness of the program**

Strengths:

- Program smoothness
- Independent thinking and teamwork
- Skill Development
- Education Environment

Weaknesses:

- Program objective achievement needs more attention
- Lack of Responsibilities in official work.
- Lack of practical work material
- Oral & Written Communication Skill

- **List future development plan for the program**

- New Extension Block
- New and advanced curriculum
- Stress on Research Work
- Latest Labs Equipments

Standard 1-4: The department must asses its overall performance periodically using quantifiable measures.

Present students enrolment (M. Sc Chemistry)

Years	No of students	No of graduate students
2009	50	44
2008	52	40
2007	55	45

Criterion 2: Curriculum Design & Organization

- A. Title of Degree Program:** M. Sc Chemistry
- B. Definition of credit hour:** One credit hour means a class of one hour per week for one term/ semester. One term means 15 weeks continuous duration program. However in case of Lab work, two hours Lab work means one credit hour.
- C. Degree Plan:** The table-1 shows the course division of the program.
- D. Curriculum breakdown:** No breakdown available for the courses. Needs improvement

Figure: 1

Following matrix links courses in the program to program outcomes

		Program Outcomes								
		1	2	3	4	5	6	7	8	9
1st Year Courses										
1st term	Physical Chemistry-1									
	Organic Chemistry-1		√							
	Inorganic Chemistry -1									
	Biochemistry-1									
	Analytical chemistry-1			√						
	English				√					
2nd term	Physical Chemistry-2									
	Organic Chemistry-2									
	Inorganic Chemistry -2									
	Biochemistry-2									
	Analytical chemistry-2			√						
2nd Year Courses										
Specialization Physical Chemistry										
S. Physical (3rd term)	Thermodynamics of Solutions	√		√						
	Radio and Nuclear Chemistry	√								
	Photochemistry	√								
S. Physical (4th term)	Spectroscopy	√								
	Statistical Thermodynamics	√		√						

	Polymer Chemistry	√											
Specialization Organic Chemistry													
S. Organic (3rd term)	Organic synthesis	√											
	Spectroscopy	√											
	Reaction Mechanism	√		√									
S. Organic (4th term)	Reaction Mechanism	√											
	Synthetic Chemistry	√											
	Natural Products	√											
Specialization Inorganic Chemistry													
S. Inorganic (3rd term)	Instrumental methods of Analysis	√		√									
	Stereo-Chemistry & Reaction mechanism	√											
	Inorganic polymers	√											
S. Inorganic (4th term)	Group theory	√											
	Organometallics	√											
	Nuclear Chemistry	√											
Specialization Biochemistry Chemistry													
Biochemistry (3rd term)	Nutrition	√											
	Physiology and Clinical Chemistry	√											
	Physical Techniques in Bio Chemistry	√											
Biochemistry (4th term)	Microbiological and Immunology	√											
	Molecular Biology and Biotechnology	√											
	Enzymes and Chemotherapy	√											

Table 1: Courses versus program outcomes

Standard 2-2: Theoretical background, problems analysis and solution design must be stressed within the program's core material.

Automation and Control Concentration (Regular Stream)	
Elements	Courses
Theoretical	Physical Chemistry-1, Organic Chemistry-1, Inorganic Chemistry -1, Biochemistry-1, Analytical chemistry-1
Problem Analysis	Physical Chemistry-2, Organic Chemistry-2, Inorganic Chemistry -2, Biochemistry-2, Analytical chemistry-2

Solution Design	Thermodynamics of Solutions, Radio and Nuclear Chemistry, Photochemistry, Spectroscopy, Statistical Thermodynamics, Polymer Chemistry, Organic synthesis, Reaction Mechanism, Synthetic Chemistry, Natural Products, Instrumental methods of Analysis, Stereo-Chemistry & Reaction mechanism, Inorganic polymers, Group theory, Organometallics, Nuclear Chemistry, Nutrition, Physiology and Clinical Chemistry, Physical Techniques in Bio Chemistry, Microbiological and Immunology, Molecular Biology and Biotechnology, Enzymes and Chemotherapy
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Table 2: Fulfilling requirements in standard 2-2

Standard 2-3: The curriculum must satisfy the mathematics and basic sciences requirements for the program as specified by the respective accreditation body

Applications of mathematics offer in the chemistry to solve the problem of mathematical calculations.

Standard 2-4: The curriculum must satisfy the major requirements for the program as specified by the respective accreditation body

The curriculum in the program is fully satisfied the major requirements and objectives of the program.

Standard 2-5: The curriculum must satisfy humanities, social sciences, arts, ethical, professional and other discipline requirements for the program as specified by the respective accreditation body

Table 3 shows how the M. Sc Chemistry program satisfies requirements in standards 2-3, 2-4 and 2-5. It's clear from the table that all requirements are met but only in the area of humanities and social sciences needs little attention.

M. Sc Chemistry	Mathematics and Basic Sciences		Chemistry Topics				Humanities and Social Sciences	
	Required	Present	Core		Elective		Required	Present
			Required	Present	Required	Present		
	2	2	4	4	12	12	0	0

Table.3: Standard 2-3, 2-4, 2-5 requirements

Standard 2-6: Information technology component of the curriculum must be Integrated throughout the program

Information technology component is the part of curriculum which delivers the knowledge of different software and computerized lab equipments. This area fulfills the requirements.

Standard 2-7: Oral and written communication skills of the students must be developed and applied in the program

Oral and written communication has been given importance in the program. Students are to take following English courses to improve their communication skills:

- English (Study Skills)
- Communication Skills

Students' skills in oral and written communication are not satisfactory, its need improvement. Action planned for the improvement.

Criterion 03: Chemistry Lab

Lab Title	Location & area	Objectives	Adequacy for Instruction	Courses Taught	Major apparatus and Equipments	Safety regulations and first aid box
Physical Lab.	WxL 30x50	To train M. Sc students in Physical chemistry	M. Sc Prev: M. Sc Final	M. Sc Training program in Physical Chemistry	1. Refractometer 2. Oven 3. Shakers 4. Electric Water Bath	Not available
Organic Lab	WxL 30x50	To train M. Sc students in Organic chemistry	M. Sc Prev: M. Sc Final	Synthesis & Analysis of Organic Compounds (Organic)	1. Grinder Machine 2. Ovens 3. Distillation Apparatus	Not available
Bio-Lab	WxL 30x50	To train M. Sc students in Biochemistry chemistry	M. Sc Final M. Phil, Ph. D.	Analysis and chemistry of Bio materials (Bio)	1. Flame Photometer 2. Floro Spectrophotometer 3. pH meter 4. Refregerator 5. Fraction Collector 6. Furnace / oven	Not available
Organic Research Lab	WxL 30x50	To provide the facility to M. Phil & Ph. D students to do research work in Organic chemistry	M. Phil/Ph. D	Characterization of Natural Bio active compounds	1. Rotary evaporators 2. Chiller compressors 3. Deep freezers 4. Incubators	Not available
Inorganic Lab	WxL 20x30	To train M. Sc students in Inorganic chemistry	M. Sc Final	Analysis of Inorganic materials and minerals	1. Balance 2. Furnace	Not available
Instrumental Lab	WxL 20x30	To train the students with different instruments used in research or practicals	M. Sc Prev: M. Sc Final	Characterization of emulsion and polymeric material (Physical/Polymer)	1. Thermostat water bath 2. DV-E viscometer 3. Flame photometer 4. Spectro photometer 5. Balance Analytical 6. Hak viscometer 7. Chromotran & other small equipment	Not available
Physical Research Lab.	16x14	To provide the facility to M. Phil & Ph. D students to do research work in physical chemistry	M. Phil, Ph.D.	Polymer, Colloid & Surface Chemistry (Physical)	1. Dynamic Light scattering instrument 2. Tensio meter 3. Balances Analytical 4. Interferer Refracto meter Basic apparatus/ Chemicals needed for M. Sc training program	Not available
Bio-Research Lab	16x14	To provide the facility to M. Phil & Ph. D students to do research work in Biochemistry	M. Sc Final M. Phil, Ph. D	Analysis of Bio material	1. Cold Cabinet 2. High Speed Centrifuge	Not available

Standard- 3-1: (Lab manuals/documentation/instruction for experiments must be available and readily accessible to faculty and students.

Lab manuals are available for each lab but no rules and regulations for safety are available. No first aid box in case of emergency. All the documented instructions for lab experiments are available to both students and faculty members. The safety regulations and first aid box will be considered in implementation plan.

Standard 3-2: There must be adequate support personal for instruction and maintaining the computing laboratories

Lab Assistants and attendants help in conduction the Lab activities; each lab has a technician, with sounds skills and technologies.

Standard 3-3: The university computing infrastructure and facilities must be adequate to support programs objectives.

Computer lab is established and equipped with computers but no access to students to take benefits from Digital library and other e-learning facilities. The internet Lab facility in the department needs improvement to fulfill the requirements of e-learning.

Criterion 4: Student Support and Advising

Standard 4.1: Courses must be offered with sufficient frequency and number for students to complete the program in a timely manner.

All the courses are first discussed by departmental academic committee. The recommendations are then discussed in the Board of Studies meeting comprising of some senior professors of the university and experts of curriculum from other universities and affiliated colleges. The recommendations of this board are further submitted to Academic committee for approval and onward submission to the syndicate. In this way the course and the curriculum passes and screens through a number of levels.

Standard 4-2: Courses in the major areas of study must be structured to ensure effective interaction between student, faculty and teacher assistants.

No proper procedure to assign the responsibility to structure courses and to maintain the consistency of contents. Improvement needs in this area to fulfill the requirements.

Standard 4-3 Guidance on how to complete the program must be available to all students and access to academic advising must be available to make course decisions and careers choices.

A faculty member is assigned responsibility to discuss and coordinate with student in taking specialization. Also the said faculty member is responsible for organizing workshops, visits of the students to different universities and industry.

Criterion 5: Process Control

Standard 5-1: The process by which students are admitted to the Program must be based on quantitative and qualitative criteria and clearly documented. The process must be periodically evaluated to ensure that it is meeting its objectives.

A very transparent system for admission in M. Sc Chemistry. No test and interview is taken for admission. Admission in this program based on the following selection criteria.

1. Candidate must have passed in at least 2nd division.
2. Candidate must have chemistry subject in the bachelor degree.
3. Merit formula:

$$\text{SSC} * 1 = X$$

$$\text{HSSC} * 2 = Y$$

$$\text{B. Sc} * 3 = Z$$

$$\text{Merit} = X + Y + Z / 6$$

Standard 5-2: The process by which students are registered in the program and monitoring of students progress to ensure timely completion of the program must be documented.

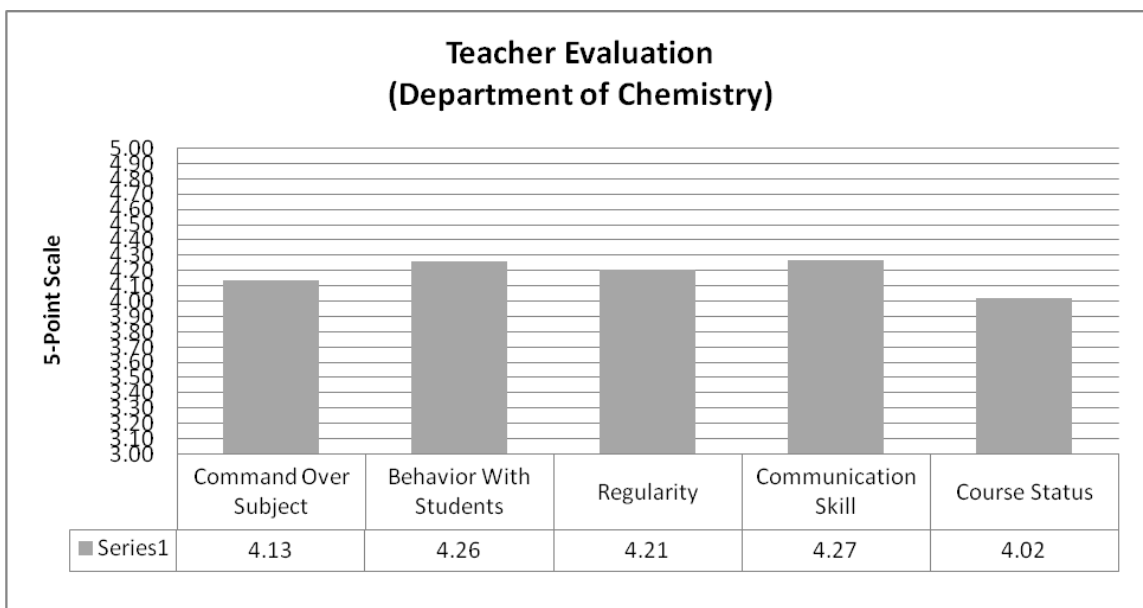
At the start of term applications are invited through leading news papers. After getting the applications students are scrutinized with reference to pre-requisite of the program. Merit list of eligible candidates is made according the formula given in standard 5-1.

To monitor the students' performance we have internal as well as external base evaluation system. In every term at least 2 tests are conducted which carry 20 % marks along with assignments at the end of the term, external exam is conducted for 80 %. The result is based over the combined assessment of the students.

Standard 5-3: The process of recruiting and retaining highly qualified faculty members must be in place and clearly documented. Also processes and procedures for faculty evaluation.

In order to attract qualified faculty , different domains of computing is defined in the programs and as per the expertise required , demand for the staff along with the expertise details is send to Administration for advertising the positions in leading English and Urdu News papers. As per the application received, the scrutiny committee short list the applicants for the evaluation test as per the criteria advertised. A third party is involved for conducting the test to make the process transparent and successful candidates of the test are further passed through a selection board in which a panel of experts interviews the candidate. After the selection board syndicate gives the approval of these selections, there after appointment is offered to the faculty.

There was no systematic process before to evaluate the faculty members, now after establishment of QEC each faculty member is evaluated by the students via “Teacher Evaluation Questionnaire”.



Standard 5-4: The process and procedures used to ensure that teaching and delivery of course material to the students emphasize active learning and that course learning outcome is met. The process must be periodically evaluated to ensure that it is meeting the objectives.

In order to ensure that the teaching is effective a quarterly survey is conducted by the University QEC and the findings are communicated to the concern faculty members. After completion of survey assessment team meeting is called to assess the process and make implementation plan for the said department.

Standard 5-5: The process that ensures that graduates have completed the requirements of the program must be based on standards, effective and clearly documented procedures. This process must be periodically evaluated to ensure that it is meeting its objectives.

No proper procedures to assure that the graduates meet the program requirements or not. This area needs concentration to develop this procedure. Plan required for this area.

Criterion 06: Faculty

Standard 6-1: There must be enough full time faculty who are committed to the program to provide adequate coverage of the program areas / courses, continuity and stability. The interests and qualifications of all faculty members must be sufficient to teach all courses, plan, modify and update courses and curricula. All faculty members must have a level of competence that would normally be obtained through graduate work in the discipline. The majority of the faculty must hold a Ph. D. in the Discipline.

The following table indicate program areas and number of faculty in each area

Program Area	Courses in the area and average number of sections per year	Number of faculty members in each area	Number of faculty with PhD
Physical Chemistry	Thermodynamics of Solutions, Radio and Nuclear Chemistry, Photochemistry, Spectroscopy, Statistical Thermodynamics, Polymer Chemistry	4	3
Organic Chemistry	Organic synthesis, Spectroscopy, Reaction Mechanism, Synthetic Chemistry, Natural Products	8	4
Inorganic Chemistry	Instrumental methods of Analysis, Stereo-Chemistry & Reaction mechanism, Inorganic polymers, Group theory, Organometallics, Nuclear Chemistry	4	2
Bio chemistry	Nutrition, Physiology and Clinical Chemistry, Physical Techniques in Bio Chemistry, Microbiological and Immunology, Molecular Biology and Biotechnology, Enzymes and Chemotherapy	3	2
Total :		19	11

It is clear from the above table that the information provided in the faculty members resumes that this standard is satisfied.

Standard 6-2: All faculty members must remain current in the discipline and sufficient time must be provided for scholarly activities and professional development. Also, effective programs for faculty development must be in place.

The department of chemistry has number of faculty members involved in research work and professional development. Research workshops arrange but no specific time frame to arrange the workshops and seminars. Improvement needs to arrange refresher courses and research workshops.

Standard 6-3: Faculty members should be motivated and have job satisfaction to excel in their profession

There are different programs for faculty benefits and there motivation i.e.

- 1) Reasonable work load and class size as per the HEC requirement for getting quality in education.
- 2) Attractive salary packages.
- 3) Paid vacations.
- 4) Hard area allowance.

For survey chart see the Graph: 1 Criterion: 8 Institutional supports Standard 8-1

A faculty survey was conducted and the response is as below:

Faculty Comments:

Q.14 What are the best program/factors currently available in your department that enhance your motivation and job satisfaction?

1. M. Phil and Ph. D. research work.

2. Good teaching and research and very handsome pay are the main factor of satisfactory.
3. Good response of the senior staff and well guidance from time to time to us very good environment of the department.
4. Teaching & Research program is the main factor for satisfaction.
5. Cooperation among teaching staff.
6. Co-operation among teachers in Teaching and Research programs is the main motivation and job satisfaction factor.
7. Co-operation among teachers in Teaching and Research programs is the main motivation and job satisfaction factor.
8. Co-operation among teaching staff in Teaching and Research programs is the main motivation and job satisfaction factor.
9. The pleasant teaching environment co-operation from colleague interaction with community is the positive aspect of this department.
10. I hereby enjoy the department due to the interaction with students and colleague.

Q.15 Suggest program/factors that could improve your motivation and job satisfaction?

1. The only factor which improves motivation of a worker all over the world is to observe merit. Social activities are introduced.
2. No test and arrangement totally exam should be external.
3. Conduction of refresher courses, seminars and English language courses, all this factor will developed the mind of all teachers.
4. Make foreign tour for most junior people.
5. Exam should be totally external.
6. Favoritism should be stopped among teachers.
7. Mutual collaboration among Department to improve the motivation.
8. Conduction of refresher course, seminar & conferences are prerequisite for the development of nation.
9. (i) Exam should be totally external.

- (ii) Favoritism should be stopped.
 - (iii) Providing research facilities.
 - (iv) Mutual co-operation among departments research improve the motivation.
- 10. (i)** Exam system should be totally external.
- (ii) Conference & Seminars in the Department improve the motivation.
- 11. (i)** Mutual Co-operation among departments for Research to improve the motivation.
- (ii) Conduction of refresher Course, Seminars & Conferences are prerequisite for the development of nation.
 - (iii) Favoritism should be stopped.
 - (iv) Exam should be totally external.
- 12.** Providing of research facilities to faculty member conduction of refresher course Seminars & Conferences are prerequisite for the development of a nation as whole and for our Institution particularly providing of research fund from own resources if possible.
- 13.** Provide research facilities internet services and multimedia facilities for teaching. Provide opportunity for higher studies.

Criterion 07: Institutional Facilities

Standard 7-1: The institution must have the infrastructure to support new trends in learning such as e-learning

The e-learning facilities are not sufficient to fulfill the requirements to meet the new challenges. Computer Lab is available with small number of computers but no access to the M. Sc students. Improvement needs for this section and will be implement in the implementation plan.

Standard 7-2 : The library must possess an up to date technical collection relevant to the program and must be adequately staffed with professional personnel

The departmental library has the collection of latest books. The total numbers of books in the library are

Name of Item	Quantity
Books	5343

Central Library:

The central library has also the facility to facilitate the chemistry department graduate students but with small number of books. Our central library has very small number of books in all fields. No e-learning facility. Improvement needs in this section.

Standard 7-3: Class-rooms must be adequately equipped and offices must be adequate to enable faculty to carry out their responsibilities

Class room shortcomings

- 1. Multimedia:** No multimedia present in the classrooms.
- 2. Sound System:** No sound system present.
- 3. Desks / Chairs:** Desks and chairs are present but their conditions are not good.
- 4. Light System:** Light system is present but not up to the requirements.

No multimedia concept here. All the lectures are delivered via white board.

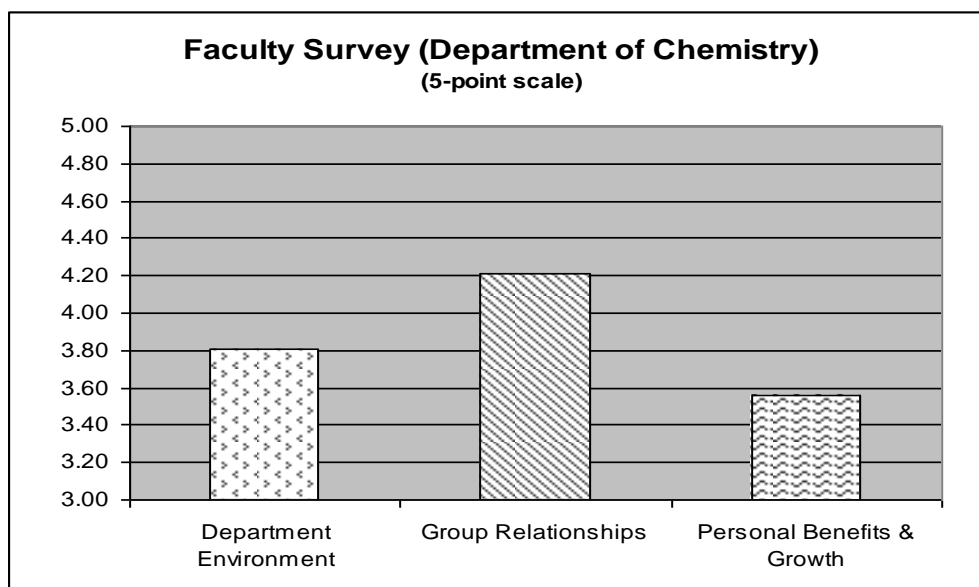
Criterion 08: Institutional Support

Standard 8-1: There must be sufficient support and financial resources to attract and retain high quality faculty and provide the means for them to maintain competence as teacher and scholar.

All the financial matters of Department of Chemistry run by University Finance Directorate and very little is left at department level. The university provides all the financial support needed to run the programs of studies in Department of Chemistry. Salaries of the faculty as well as supporting staff are facilitated by the university. The compensation including benefits like housing and children are also provided by the administration.

The University has the department of Staff Welfare which is run by the SWO (Staff Welfare Officer).

For this purpose we have conducted the survey



Graph: 1

Standard 8-2: There must be an adequate number of high quality graduate students, research assistants and PhD students.

Currently Department of Chemistry has broad approach towards research but there is also some problems facing by the students during research.

1. lack of chemicals
2. Lack of funds for the functioning of research equipments.

Standard 8-3: Financial resources must be provided to acquire and maintain library holding, laboratories and computer facilities

At the moment the departmental library has almost 5343 volume of books, out of these most are latest in different fields.

The department has established a computer lab which has the facility of internet and digital library.

The department is well equipped with request to latest instant and the student has the facility to perform the experiments. However, the department is facing problem to get chemicals etc for practical as well as for research.